

The Evolution of the Engineer Force: Part I

By Dr. Larry Roberts

While engineers have been a component part of the American Army since the days of the American Revolution, the force structure of the engineers, as understood today, is a 20th century phenomenon. The structure of the force has changed over the last 90 years in response to changes in doctrine, tactics, and national military strategy. However, the battlefield functions of engineers have remained constant. Indeed, the basic missions of engineers, or those performing engineering work, have remained the same since the dawn of organized human conflict. Simply stated, engineers facilitate the movement of the maneuver arms, obstruct or impede the movement of the enemy, and construct works necessary to protect and sustain the army in the field.

World War I

The basic structure of the modern engineer force dates from World War I. Before 1917, engineers were generally considered technical troops whose work largely focused on roads, fortifications, and

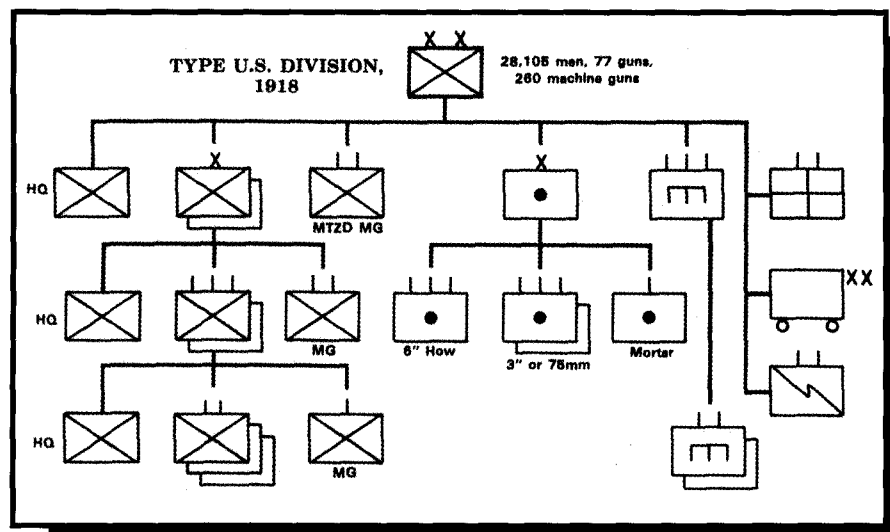
facilities. Engineers were generally under the direction of the field army commander. Before World War I, there were only three engineer battalions in the Regular Army. In previous conflicts, such as the Civil War, engineer regiments—often volunteer organizations—were raised for the conflict and demobilized at the cessation of hostilities.

The driving force in changing this status was the advent of the combined-arms division. Before World War I, divisions were largely single-arm organizations, mostly infantry. Support units of artillery, and in some cases engineers, were assigned only as the tactical situation dictated. In 1911, the War Department began design work on a “maneuver division.” The objective was to field a division comparable to those of European armies which contained all of the requisite combat, combat-support, and combat-service-support elements needed to fight as a self-contained force. The Corps of Engineers was heavily involved in this effort and ultimately recommended an engineer regiment for this division. By the entrance of the United States into World War I, this division had

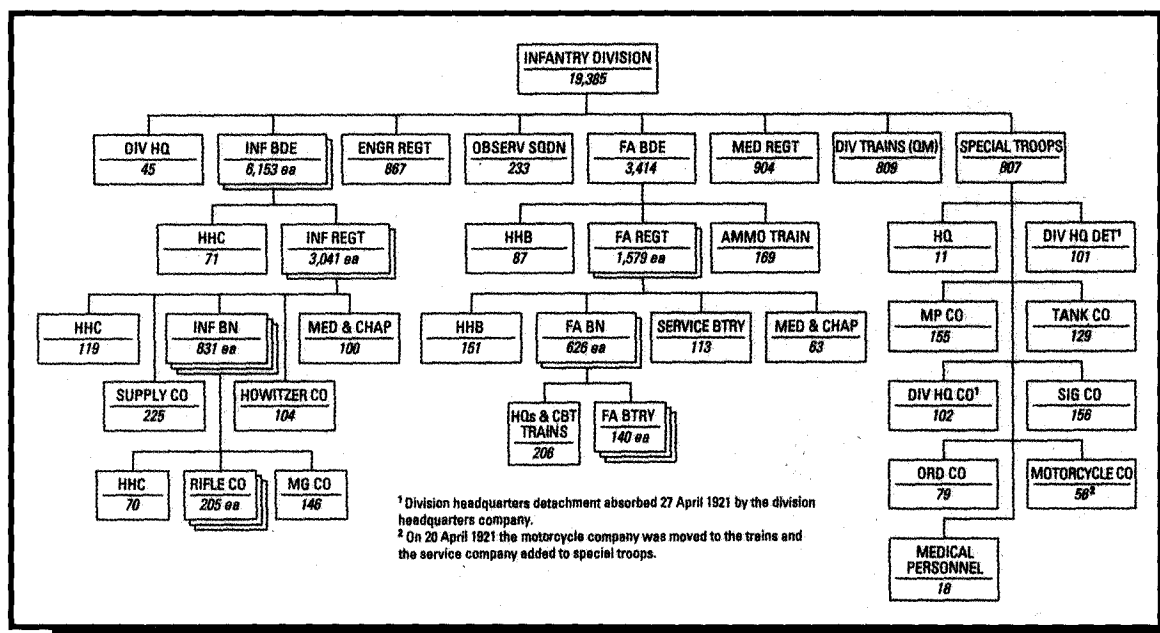
been tested and adopted as the standard tactical organization for war. Although adjusted by lessons learned in France during the war, this structure remained in effect for more than 20 years. Because the cornerstones of the division were four infantry regiments, the organization was referred to as the “square” division.

The engineer regiment assigned to this organization mustered 1,634 officers and men. In addition, the regiment had a trains section with an additional 84 officers and men who provided transportation, both horse-drawn and mechanical. The divisional regiment relied on picks and shovels for most of the engineering work performed. Building fortifications, constructing bridges, doing pioneer-level roadwork, and serving as the divisional reserve were the major tasks. The regiment consisted of two battalions with three companies each. The basic work unit in the regiment was the six-squad platoon. Each company had four platoons. This regiment was expected to perform all of the engineer work in the division sector.

Army planners, including engineers, did not have time before World War I to examine the proper composition of corps and armies. What emerged by 1919 was based totally on the experiences in Europe. Engineers and others quickly recognized the need for additional units at the corps and army levels. Two different types of organizations came into being. The first was a basic engineer labor battalion, referred to later as the separate battalion. These were largely work units comprised of black soldiers and white officers and NCOs. The second type of engineer unit was a specialized organization. The American Army in France ultimately had engineer railway, port-construction, forestry, mechanical, electrical, and depot units. As their names implied, these units concentrated on a particular aspect of general engineering



U.S. Army Divisional Structure - World War I



Division Structure - 1920

in support of their corps or the army as a whole. The need for construction or sustainment engineering was so great that engineer railway regiments were among the first American troops to arrive in France.

The Interwar Period, 1919-1941

In the years following World War I, the Army—and by extension the engineer force structure—underwent substantial changes. In most instances, the changes were in the nature of reductions in the size of divisions and supporting units. These changes were prompted by several factors: First, the national military policy of the United States changed. Disillusioned by the Treaty of Versailles and the general outcome of the war, the American people turned their back on involvement in international affairs; isolationism became the trend. Consequently, the Army shifted its focus to defense of the continental United States and, to a lesser degree, its overseas possessions. Believing that the threat to the United States was minimal because of the ocean barrier, few individuals saw the need for a substantial military force. Hence, the Army was cut in both manpower and equipment.

Second, Army leaders, reviewing the performance of the American

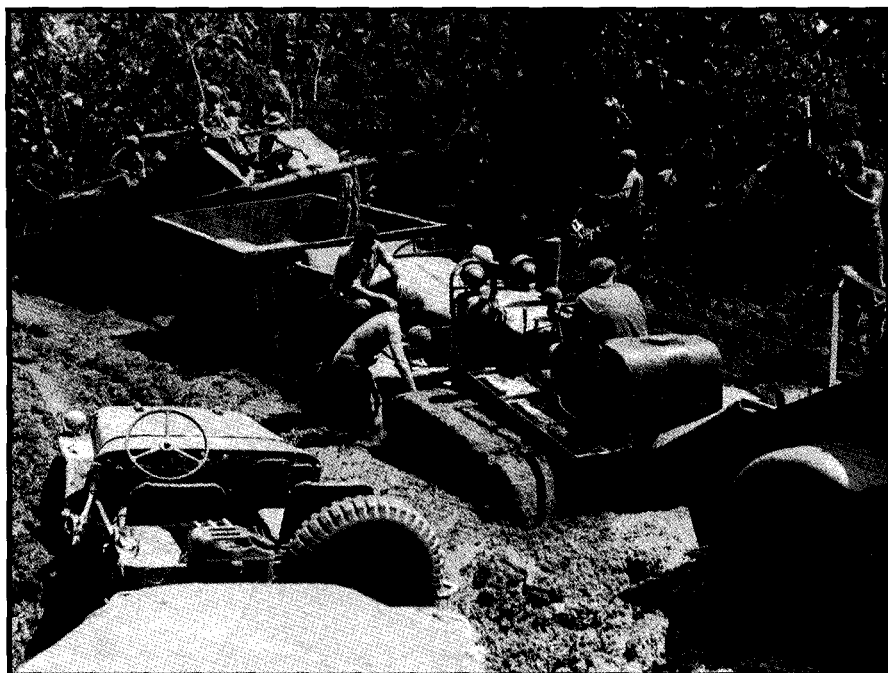
Expeditionary Force in France, believed that changes were needed. While the 28,000-man square division might have been appropriate for a war of trenches, “open warfare” called for a more mobile force. In this context, mobile meant the ability to move the division tactically and, to a lesser extent, strategically. Lacking shipping, the United States had been forced to send its units to France with little more than personal equipment and infantry small arms. Artillery, transport (both mechanical and animal), and other equipment were provided on the continent by the British and the French. At the tactical level, the movement of the large division constituted a transportation nightmare. The “road space” or transportation footprint of a division became a major factor for those planning future organizations.

The divisional structure was therefore trimmed in the 1920s and early 1930s. The overall strength of the division declined from the 28,000-plus World War I unit to an organization of slightly more than 19,000 in the 1920s. While some of the reductions were in the combat arms, a large part was in the combat-support units.

The Engineer Regiment was effectively cut in half. This reduction was based on two thoughts: First, the return to open warfare reduced the dependence

on field fortifications, a major task of the engineers. Second, a division requiring less road space would have a reduced need for roads and the associated works such as bridges. Although a two-battalion regiment was retained, the number of platoons in each company was reduced from four to two. Similarly, the number of squads in the platoons was reduced from six to four.

Army planners essentially ignored the issue of organizational design for corps and army organizations. While war plans did call for a specific number of corps and army units, the functional organization of these units and their relationship to the maneuver division received little attention. The Corps of Engineers did examine the issue and changed the nature of its forces at echelons above division. Nondivisional units fell into one of two categories, general and special. The engineer general-service regiment and separate battalion were units that performed general engineer support functions for the corps and divisions, mainly road construction and maintenance. Special units included railway, topographic, heavy and light pontoon, water supply, and depot battalions and companies. Engineer doctrine projected that two-thirds of the field army’s engineer force would be nondivisional in nature, either general or special.



Motorization and mechanization were supposed to reduce the need for engineers.

There were more organizational changes in the 1930s. The changes in the divisional structure in 1932 were comparatively minor. However, changes made at the end of the decade were significant. In 1935, the Chief of Staff, General Malin Craig, directed a review of the organization and tactics of the Army. Craig wanted to increase the tactical mobility of the division and incorporate new developments and technologies made in the areas of armor, motor vehicles, airplanes, communications, and weapons. For the next 5 years, the Army would wrestle with the organization of the division and the tactics it would employ in war. The advent of the German blitzkrieg in 1939 and 1940 hastened the work and forced the Army to finalize its design in 1940 and 1941.

For engineers, the issue revolved around the issues of tactical mobility, firepower, and armored protection. Many in the Army, primarily General Leslie McNair, believed that the modern division had to be light and highly maneuverable. Units not needed on a habitual basis would be withdrawn from the division and assigned to the corps. Improved cross-country mobility for fighting vehicles and even cargo trucks obviated the total dependence on roads. Proper reconnaissance, coupled with improved

tactical mobility, would permit either the seizure of bridges before demolition or the determination of alternate routes when bridges were destroyed. A highly mobile force, especially one including armored vehicles, had little need for field fortifications or obstacles. Increased firepower, coupled with mobility, precluded the need for breaching forces, as the tactical unit would either go around established field fortifications or seize the ground before the enemy could emplace them.

These beliefs coalesced in the "triangular" division, a division with approximately 15,000 officers and men. The term triangular referred to the fact that the fighting strength of the division was found in the three infantry regiments, as compared to the four regiments of the square division. Divisional support units were either drastically cut or transferred completely to the corps.

Engineers fought a determined battle to retain a viable force for this new organization. Initial proposals called for a divisional engineer battalion of slightly more than 500 officers and men. At one point, however, the Corps responded to a subsequent proposal to reduce this to an engineer company of 175 officers and men. By 1940, the Corps had convinced the Army leadership that a battalion of

slightly more than 600 officers and men was the proper unit for providing engineer support to the division. There were many engineers who believed that more engineers were needed. However, the leadership of the Corps adopted an approach of arguing for what they believed they could get, rather than what was needed. The divisional engineer battalion for the new armored divisions was slightly larger because of the addition of a bridge company.

The Corps was more successful in developing a viable engineer force at echelons above division. By 1941, the corps were authorized two combat regiments with 1,257 officers and men each. The mission of these two-battalion regiments was to perform all the engineering work in the corps area and, when needed, engineer work in the division area. The existence and size of these regiments was a concession on the part of the Army and the Corps that the divisional engineers did not have sufficient strength to accomplish all the engineering tasks in the division area. Corps combat units tended to have the same weapons as the divisional engineers but with more equipment. Doctrine generally oriented the corps engineer regiments to roads, bridges, and rear-area fortifications. Doctrine also called for the corps engineers to move forward to the front lines and provide direct support for division operations in cases such as river crossings.

The pre-World War II engineer force structure called for three general-service regiments, six separate battalions, and a number of special units, such as maintenance and supply companies, at the army level. The general-service regiments had slightly more than 1,200 officers and men and the requisite heavy equipment to perform the more substantial work needed on roads, bridges, and facilities. The separate battalions were as large in manpower as the general-service regiments. Ironically, the battalion's organization and functions were more closely related to the divisional combat-engineer battalion than other army-level organizations. As a matter of custom, the battalions were designed to augment the corps combat regiments as

needed. Other engineer units at the army level included topographic, railway, pontoon, dump truck, depot, and maintenance units. Additional general-service regiments, separate battalions, and special units were authorized for the general headquarters (GHQ) echelon. In reality, this was the part of the theater of operations which contained the services of supply.

World War II

In May 1941, the Chief of Engineers, Major General Julian Schley, spoke to a gathering of the Society of American Military Engineers in Washington, D.C. He outlined the current status of the Corps and the strides that had been made in developing engineer organizations. Schley tried to ease the fears of many by saying that the advent of heavy machinery and power tools had more than compensated for the decline in the manpower in divisional units. This—plus the existence of an extensive engineer force at corps, army, and GHQ—meant that the engineers could meet the challenges of modern war. However, what Schley—and many maneuver commanders—did not recognize was that the modernization of the Army had in fact increased the engineer workload in war. The advent of armored forces increased dramatically the demand for stronger,

more mobile bridges. The heavy cargo trucks adopted by the Army increased the demand for road construction, where roads were primitive or nonexistent, and road maintenance for existing routes. While trenches and associated field fortifications may have passed into history, they were replaced by mines and any number of other expedient obstacles.

Engineers responded to the increased demand for engineer troops by adjusting boundaries within the division, corps, and even army zones of operation. Corps combat units often performed work in the divisional area immediately behind the front lines. They also worked along with divisional engineers in operations such as river crossings and breaching operations. In fact, it became unwritten doctrine in Europe that actual river crossings and bridge construction would be done by corps engineers. This freed divisional engineers to assist the maneuver forces on the far shore. In Europe and the Pacific, a corps engineer battalion was habitually attached, and even located, in the divisional area. In certain operations, corps engineer support exceeded a single battalion. The 19th Engineer Combat Regiment provided the river-crossing support for the 36th Division during the crossing of the Rapido River in Italy. The 1171st Engineer Combat Group supported the 28th Infantry

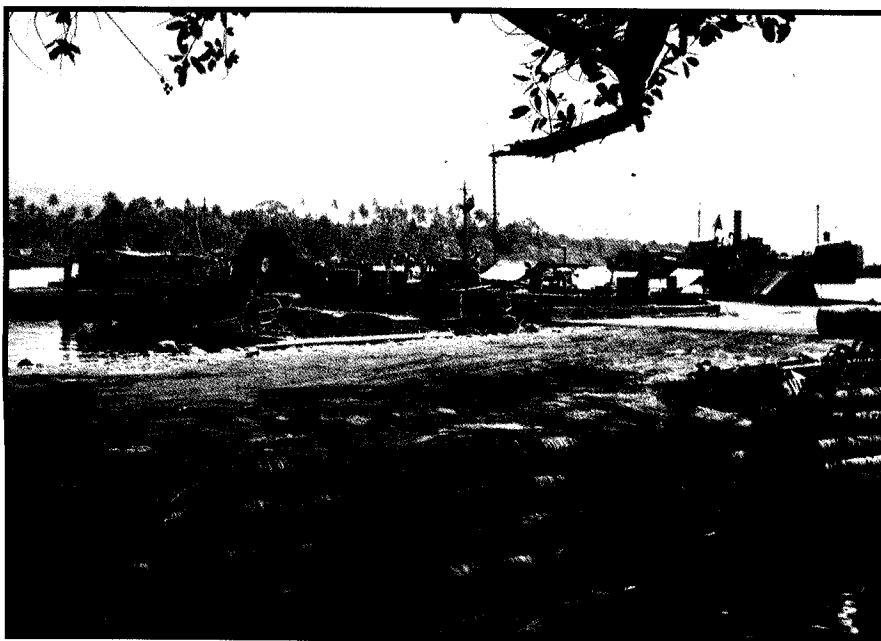
Division in its disastrous battle at Schmidt and in the Hurtgen Forest.

This level of commitment to supporting the divisions often forced the corps engineer to ask for help from the army. Consequently, army engineer units, often general-service regiments, ended up working in the forward corps area. As might be expected, the army engineer called on the communications zone engineer for assistance in performing needed engineer work in the army area.

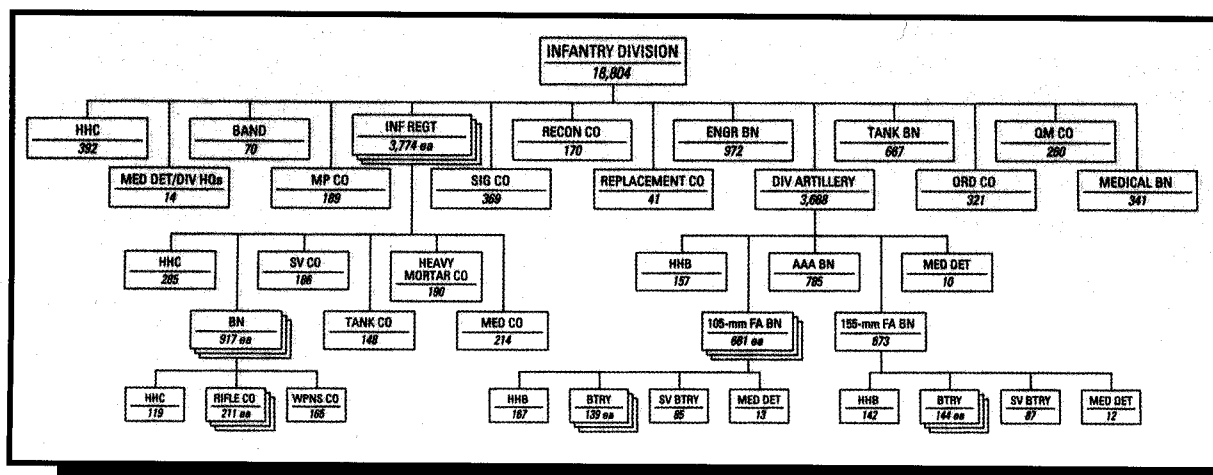
Following the war, the European Theater convened a general board to examine tactics and organizations with the objective of making recommendations for the postwar Army. The officers who examined engineer tactical policy noted, "The inadequacy of the engineer component of the division caused an abnormal forward displacement of engineers in all echelons." The published history of the engineers in the Southwest Pacific noted:

"The division engineer troop component of one combat battalion proved without exception to be incapable of providing sufficient close support for a division. It was grossly inadequate to meet the requirements imposed upon it by the tactical and technological conditions faced in the Pacific.... To provide the required engineer support, therefore, it became the standard practice to augment the engineer component of a division by attaching an additional engineer battalion from corps troops. This standard practice was followed, not alone in the interest of the engineers, but in compliance with the direct requests of army, corps, and division commanders who repeatedly recommended that a definite provision be made within the authorized organization of the division for this additional engineer battalion to permit continuity of training as well as employment."

An analysis of the Army force structure showed that for every infantry or armored division, there were 1,668 combat-engineer troops and 2,276 support-engineer troops at corps, army, or the communications zone. The former were primarily in the combat battalions, the latter were in the general-service regiments,



Dock and pier facilities in New Guinea, Southwest Pacific



Infantry Division Structure - 1948

and special engineer forces were operating well forward of the administrative and operational boundaries which defined division, corps, and army areas. In spite of this circumstance, there was no significant change in the structure of divisional engineers. The armored engineer battalion was reduced late in the war by the deletion of the bridge company, which was moved to corps control.

There were changes to the force structure for corps and army engineer units. In late 1942, the War Department started to convert nondivisional regiments to groups. Advocated by McNair, the argument was that the group was a more flexible command and control headquarters. Regiments were limited to their authorized battalions. Groups could control a varied number of subordinate elements. This would allow corps and army commanders to shift battalions and companies to areas where they were needed, while maintaining the continuity of the group headquarters associated with a tactical area. Engineer commanders generally considered this to be a bad idea. First, the regimental structure enhanced esprit and morale. Separate units, with little or no history, would be hard-pressed to establish this pride of unit. Second, the separate battalions had to have sufficient administrative and logistical personnel and transport to allow it to function independently. Providing these resources for battalions created larger personnel and equipment bills than was required under the regimental organization. These concerns, shared with

many other branches, were generally ignored. Consequently, the corps engineer combat regiments were broken up in 1944, and their battalions were given separate numerical designations. Ultimately, general-service regiments suffered the same fate. The War Department also began transforming the large separate battalions to one or more standard engineer combat battalions.

A second change for the engineers involved a reorientation of engineer general-service regiments. While these organizations performed a variety of functions, the term "construction" tended to describe most of them. Consequently, engineer commanders, primarily in the Pacific, began to urge the redesignation of general-service regiments and battalions as construction battalions and groups. In the Pacific, the need to build most of the logistical and transportation infrastructure for American forces tended to focus army and corps engineers on this function. The process of redesignating general-service regiments and similar organizations to construction units had been largely completed by the end of hostilities in the Pacific.

As it had done in 1920, the Army examined its wartime structure in an effort to determine the most effective organizational structure for the postwar force. As has been mentioned, the general boards were created in Europe for this purpose. Although not formalized in boards, other theater commanders and their subordinate commands and staffs

also forwarded recommendations. Senior engineer commanders were unanimous in recommending a return to the two-battalion engineer regiment for the division. They also recommended the return to the regimental structure for larger corps and army engineer units. Senior commanders in the Pacific noted that group commanders ended up devoting more time to the incoming or outgoing movement of separate battalions than they did the management and support of those under their control. Engineers in both Europe and the Pacific agreed that combat and construction units were the principal elements of the engineer force in war and that specialized units—such as topographic, maintenance, water, and depot—continued to fill a needed unique-mission requirement for deployed forces.

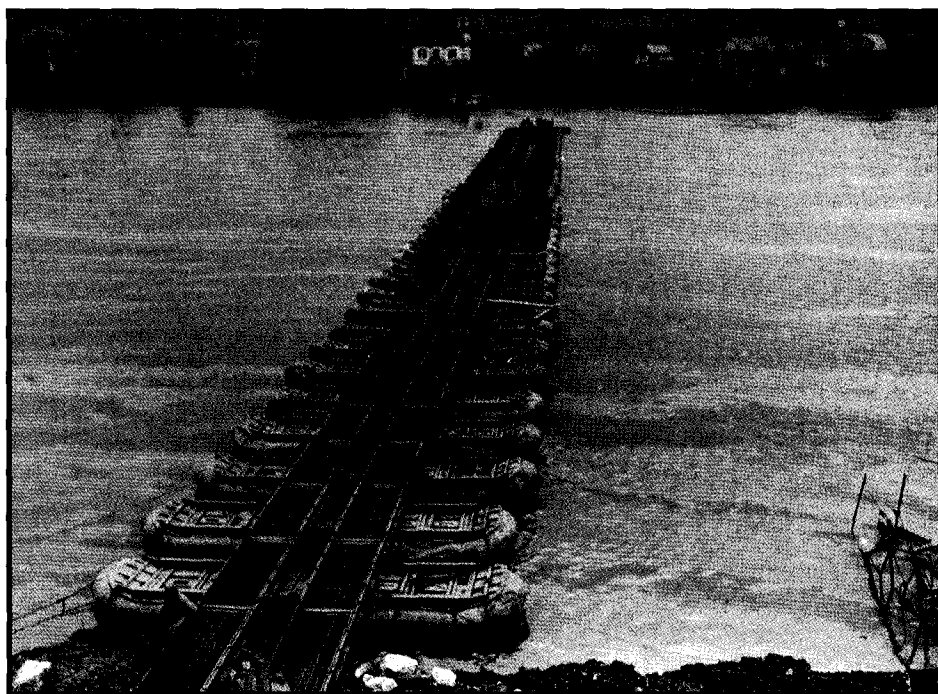
Engineer Force Structure, 1946-1950

The Corps was partially successful in convincing senior Army leaders that the engineer force of the field army needed significant increases. However, it was not successful in reconstituting either the two-battalion divisional engineer regiment or the regimental organization as a whole. This was in spite of the fact that the maneuver arms, principally the infantry, retained the regimental system for another 10 years. In 1948, the Department of the Army reorganized the infantry division, based on the experiences of World War II. Divisional engineer battalions were

increased almost 50 percent. This was largely through the addition of a fourth letter company and the addition of a bridge platoon and an assault platoon to the headquarters and headquarters company. The armored divisional engineer battalion had a corresponding increase in personnel and equipment. With the addition of the fourth lettered company, the division engineer could allocate one company to each of the division's regimental combat teams and retain the fourth company for work within the division area. The fourth company could also reinforce one of the other battalions as needed. Doctrine at that time accepted that "In a major attack, the engineer battalion will normally need and receive assistance from a corps engineer combat group." This assistance could take the form of relieving the divisional engineers from other work in the division area or direct assistance in the attack itself.

The divisional support role of non-divisional combat battalions was clearly evident in their organizational structure. The engineer combat battalion-army had 712 officers and men. It was similar to the divisional battalion with several important exceptions. First, the battalion had only three companies and lacked the bridge and assault platoons of the divisional battalion. It also had less construction equipment—such as road graders, cranes, and trucks—than the division. Clearly, the battalion's function was to reinforce the maneuver units. It lacked the equipment and personnel to perform substantial construction work in either the division or corps area. The construction-type work in the corps area—such as roads and bridges—was assigned to separate companies attached to the engineer combat group. These included dump-truck, light-equipment, and bridge companies.

There were no engineer units specifically assigned to the corps. All nondivisional organizations were assigned to either the army or the communications zone. The existence of



A tactical bridge built across the Rhine River by a corps engineer combat battalion.

engineer units at the corps meant that a number of organizations were "attached" to the corps as needed. Depending on the tactical situation and the units required, one or more group headquarters was attached to the corps to provide command and control. Existing doctrine did accept that on a normal basis, there would be two combat groups (each with three battalions and associated companies) per corps (of three divisions). This would allow the allocation of a battalion to each of the divisions, leaving the other three for work within the corps area. Not all non-divisional combat battalions or groups were to be found in the corps. Doctrine and force structures called for at least two combat groups (three battalions and supporting companies) per field army, in addition to the divisional and corps engineer units.

The construction battalion and groups were considered either army or communications-zone assets. Doctrine generally precluded their use in the corps and division areas. These units were responsible for the more permanent road, bridge, and facility work needed in the rear areas. The units were joined in army and communications zone areas by technical units such as

port-construction, depot, and maintenance units.

At the end of the first half of the 20th century, the engineers had developed a force structure based on the lessons of two world wars. That structure had been tested in theaters of operation around the globe. The challenge for the second half of the century was to apply this structure and the associated lessons with conflicts short of conventional war. This was made additionally difficult as the Army increasingly looked to technology to solve battlefield problems. Equipment became systems and moved from being implements of war to the cornerstone of doctrine and force structure.

This is the first of a two-part article. Part II begins with force structure during the Korean War and continues through the 20th century, to include Vietnam, Desert Storm, and the Engineer Restructure Initiative.



Dr. Roberts is the U.S. Army Engineer School historian at Fort Leonard Wood, Missouri.